

# PATENT ABSTRACTS OF JAPAN

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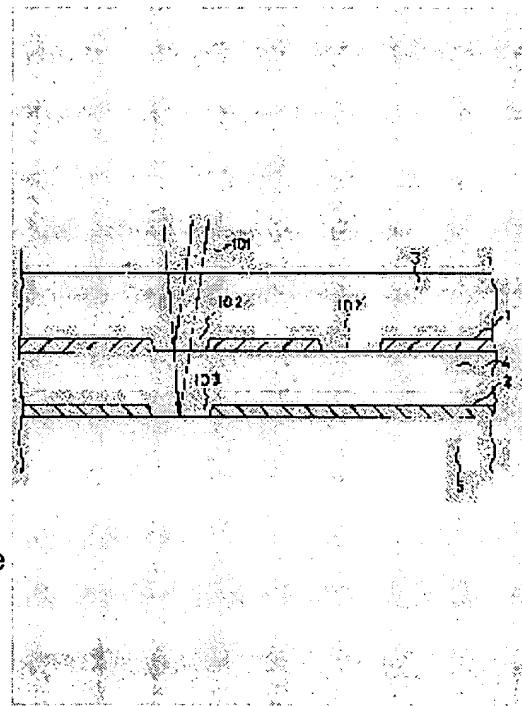
(22)Date of filing : 29.11.1996 (72)Inventor : IWAKATA NOBUYUKI

## (54) DOUBLE DENSITY OPTICAL DISK

### (57)Abstract:

PROBLEM TO BE SOLVED: To double storage capacity without changing the size or the recording density of a recording medium by providing recording films on which pits are formed in two layers and discriminating the presence or absence of pits of recording films of respective layers with planes of polarization of reflected lights.

SOLUTION: A semitransmission type aluminum reflection film 1 is provided on the recording film of an optical disk (CD) and a polarizing layer 4 having a polarization characteristic in the rotational direction of the optical disk is provided between first and second aluminum reflection films 1, 2. Consequently, a reflection from the first reflection film 1 becomes a reflected light having no polarization characteristic and also a reflection from the second reflection film 2 becomes the reflected light polarized in the rotational direction. Then, the pit information of the first recording film are detected by detecting the reflected lights of the optical disk every plane of polarization of the rotational direction and a centrifugal direction and by detecting the polarized wave of the centrifugal direction. Moreover, the pit information of the second recording film are detected by subtracting the signal detected from the reflected light of the centrifugal direction from the polarized wave of the rotational direction.



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## CLAIMS

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## [Claim(s)]

[Claim 1] The optical disk which forms the record film which forms a pit (record hole) in two-layer, and identifies the existence of the pit of the record film of each class by the plane of polarization of the reflected light and which is characterized by coming to be constituted like.

[Claim 2] A pit (record hole) is formed between a transparency layer and the base, even if few, it has the 1st and 2nd record film, and said 1st record layer is considered as half-transparency. Between said 1st record layer and said 2nd record layer The optical disk with which the polarization layer which polarizes the reflected light from said 2nd record layer in the predetermined direction is inserted, and the existence of the pit of said 1st and 2nd record layers is identified by the plane of polarization of the reflected light of the light by which incidence was carried out and which is characterized by being constituted like.

[Claim 3] The optical disk unit characterized by having a plane-of-polarization detection means for reading the information on the optical disk which it comes to constitute like to form the record film which forms a pit (record hole) in two-layer, and to identify the existence of the pit of the record film of each class by the plane of polarization of the reflected light.

[Claim 4] The optical disk unit characterized by forming the record film which forms a pit (record hole) in two-layer, dividing and detecting the reflected light from the optical disk which is constituted and becomes to the plane of polarization which intersects perpendicularly mutually so that the existence of the pit of the record film of each class may be identified by the plane of polarization of the reflected light, and identifying the existence of the pit of the record layer of said each class.

[Claim 5] A pit (record hole) is formed between a transparency layer and the base, even if few, it has the 1st and 2nd record film, and said 1st record layer is considered as half-transparency. Between said 1st record layer and said 2nd record layer The polarization layer which polarizes the reflected light from said 2nd record layer in the predetermined direction is inserted. The existence of the pit of the said 1st and 2nd record layer identifies by the plane of polarization of the reflected light of the light by which incidence was carried out. In reproducing the signal from the optical disk constituted like from the reflected light from said optical disk It has 1st and 2nd detection means to detect polarization of the direction which intersects perpendicularly in the polarization direction and said polarization direction of a polarization layer of said optical disk, respectively. The optical disk unit characterized by what the pit information on said 1st record film is outputted from said 2nd detection means, and the pit information on said 2nd record film is outputted for from the operation output of the said 1st and 2nd detection means.

[Claim 6] The optical disk according to claim 1 or 2 characterized by said record film consisting of aluminum reflective film.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to optical disks, such as CD-ROM which performs reading by the reflected light, about an optical disk unit and its optical disk for record.

[0002]

[Description of the Prior Art] Conventionally, in optical disks, such as CD-ROM, the pit (record hole) was formed in the record film formed on the base (protective layer; substrate) (perforation method), and record playback of the information was carried out by the reflected light produced by the existence of a pit.

[0003] Drawing 3 is drawing showing the configuration of the conventional optical disk. In drawing 3 , the aluminum reflective film whose 5 is the base (protective layer) and whose 2 is record film, the pit where 102 was formed in record film, and 101 show the laser beam (reflected light). By condensing a strong laser beam as a recording method, for example, irradiating on record film 102, dissolving the record layer of the part, and bringing together in a spot circumference part with surface tension It is reading by forming a pit 102, scanning weak reinforcement by the laser beam at the time of playback of a signal, and changing a change (the pit section smallness on the strength [ optical ]) of the reflected light by the existence of a pit on the strength into an electrical signal with a photodetector.

[0004] In the conventional optical disk shown in drawing 3 , 1 bit (bit) information is written in one pit 102.

[0005]

[Problem(s) to be Solved by the Invention] In the above-mentioned conventional method, unless the magnitude of a record medium or recording density is changed, it has the trouble that storage capacity cannot be increased.

[0006] The reason is because the location of a pit (record hole) cannot be changed in order to maintain a conventional record medium and compatibility.

[0007] In addition, although it differs from a perforation method In the phase change method which a record phase is made to cause the phase change of a crystallized state and an amorphous condition by the exposure of a laser beam, and records information As the multiplex record approach which writes two or more signals in the part by which one light beam on a record medium was irradiated according to the informational number of bits, to JP,2-31329,A By modulating power of the laser beam to irradiate, the intermediate state of a crystallized state and an amorphous condition is established, and the approach and equipment which write two or more information in one laser beam exposure part, and perform multiplex record are proposed.

[0008] Therefore, this invention is made in view of the trouble of the above-mentioned conventional method, and the purpose is in offering the optical disk and optical disk unit which double storage capacity, taking transposition in respect of the conventional method, and recording density and a medium by writing the information for 2 bits in the pit (record hole) which was recording the information for 1 bit (bit) conventionally.

[0009]

[Means for Solving the Problem] In order to attain said purpose, the optical disk of this invention is characterized by the thing which form the record film which forms a pit (record hole) in two-layer, and identifies the existence of the pit of the record film of each class by the plane of polarization of the reflected light and which it comes to constitute like.

[0010] Moreover, the optical disk unit of this invention is characterized by having a plane-of-polarization detection means for reading the information on the optical disk which it comes to constitute like to form the record film which forms a pit (record hole) in two-layer, and to identify the existence of the pit of each class by the plane of polarization of the reflected light.

[0011] The optical disk unit of this invention divides and detects the reflected light from an optical disk to the plane of polarization which intersects perpendicularly mutually, and identifies the existence of the pit of a two-layer record layer.

[0012]

[Embodiment of the Invention] The gestalt of operation of this invention is explained below. In the gestalt of the desirable operation, the optical disk concerning this invention forms two layers of record film which forms a pit (record hole) with the 1st and 2nd record film (1 of drawing 1 , 2), prepares a polarization layer (4 of drawing 1 ) between two-layer record film, and identifies the existence of a pit by the plane of polarization of the reflected light.

[0013] That is, in the gestalt of desirable operation of this invention, the 1st record film (1 of drawing 1 ) of an anti-transparency mold is formed on the record film (2 of drawing 3 ) of the conventional optical disk (CD), and the polarization layer (4 of drawing 1 ) which has a polarization property in the hand of cut of an optical disk is prepared between the 1st and 2nd record film (1 of drawing 1 , 2).

[0014] Thereby, the reflection from the 1st record film (1 of drawing 1 ) serves as the reflected light without a polarization property, and the reflection from the 2nd record film serves as the reflected light which polarized to the hand of cut.

[0015] Moreover, in the gestalt of the desirable operation, the optical disk unit concerning this invention divides the light from the above-mentioned optical disk into the plane of polarization (for example, the hand of cut and the centrifugal (path) direction of an optical disk) which intersects perpendicularly, and identifies the existence of the pit of a two-layer record layer.

[0016] That is, the pit information on the 1st record film (104 of drawing 2 ) is detected by the optical disk unit concerning the gestalt of desirable operation of this invention detecting the reflected light of an optical disk for every plane of polarization of a hand of cut and the centrifugal direction, and detecting the polarization wave of the centrifugal direction.

[0017] Moreover, since the polarization wave of a hand of cut contains the reflected light of the 1st record film and the 2nd \*\*\*\*\*\*, the pit information on the 2nd record film (105 of drawing 2 ) is detected by multiplying by the coefficient A and deducting the signal detected from the reflected light of the centrifugal direction.

[0018]

[Example] The gestalt of operation of above-mentioned this invention is explained below with reference to a drawing about the example of this invention that it should explain to a detail further.

[0019] Drawing 1 is drawing showing the configuration of one example of the optical disk of this invention, and shows the cross section of an optical disk typically. The aluminum reflective film (anti-transparency) whose 1 is the 1st record film in drawing 1 , the aluminum reflective film whose 2 is the 2nd record film, The pit (record hole) where the base (protective layer) and 101 were formed in the laser beam (reflected light), and 102 was formed [ 3 / a transparency layer and 4 ] in the aluminum reflective film 1 for a polarization layer (it polarizes to the hand of cut of a disk) and 5, and 103 show the pit (record hole) formed in the aluminum reflective film 2, respectively.

[0020] If drawing 1 is referred to, in this example, an optical disk will form the polarization layer (it polarizes to the hand of cut of a disk) 4 between the base (protective layer) 5 and the transparency layer 3, and will form the aluminum reflective film 2 under the aluminum reflective film 1 (transflective) and the polarization layer 4 on the polarization layer 4. This aluminum reflective film 2 is equivalent to the

aluminum reflective film (2 of drawing 3 ) of the conventional optical disk (CD).

[0021] Pits 102 and 103 are formed in the location with which it laps mutually in the aluminum reflective film 1 and 2 with reference to drawing 1 .

[0022] Drawing 2 is the block diagram showing the important section configuration of one example of the optical disk unit concerning this invention.

[0023] When drawing 2 is referred to, in this example, an optical disk unit is equipped with the subtractor circuit 9 which deducts the detecting signal of the photosensor 8 of the centrifugal direction polarization, and consists of detecting signals of the photosensor 7 of the hand-of-cut polarization which detects for every plane of polarization which intersects perpendicularly the laser beam (reflected light) from an optical disk 6, the photosensor 8 of the centrifugal direction polarization, and the photosensor 7 of hand-of-cut polarization.

[0024] Next, actuation of the example of this invention is explained with reference to drawing 1 and drawing 2 .

[0025] An optical disk can have the information on the aluminum reflective film 1 and the aluminum reflective film 2 in a laser beam (reflected light) 101 by considering the aluminum reflective film 1 as anti-transparency. Moreover, a polarization property can be given to the reflected light 101 from the aluminum reflective film 2 by giving a polarization property to the polarization layer 4 in the hand of cut of a disk.

[0026] With reference to drawing 2 , the photosensors 7 and 8 of the hand of cut which intersects perpendicularly, respectively, and the centrifugal direction detect the laser beam (reflected light) 101 from the optical disk 6 of a configuration of having been shown in drawing 1 with an optical disk unit.

[0027] Although the reflected light from the aluminum reflective film 1 of an optical disk 6 does not have a polarization property, since the reflected light from the aluminum reflective film 2 polarizes to the disk hand of cut through the polarization layer 4, from the photosensor 8 of the centrifugal direction, the pit information 104 on the aluminum reflective film 1 is detected.

[0028] Moreover, from the photosensor 7 of a hand of cut, the reflected light from two aluminum reflective film 1 and 2 is detected. For this reason, the pit information 105 on the aluminum reflective film 2 is detected by multiplying by the predetermined coefficient A and deducting the detecting signal of the photosensor 8 of the centrifugal direction from the detecting signal of the photosensor 7 of a hand of cut in a subtractor circuit 9.

[0029]

[Effect of the Invention] As explained above, according to this invention, the effectiveness that storage capacity can be increased twice is done so, taking the conventional optical disk (CD), the magnitude of a medium, and the compatibility of recording density.

[0030] In this invention, the reason uses plane of polarization and depends a pit (record hole) on the thing which can carry out two-layer formation in the same location and which was made like.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the cross-section configuration of the optical disk concerning one example of this invention.

[Drawing 2] It is the block diagram showing the important section configuration of the optical disk unit concerning one example of this invention.

[Drawing 3] It is drawing showing the configuration of the conventional optical disk.

[Description of Notations]

- 1 Aluminum Reflective Film 1 (Anti-Transparency)
- 2 Aluminum Reflective Film
- 3 Transparency Layer
- 4 Polarization Layer (it Polarizes to Hand of Cut of Disk)
- 5 Base (Protective Layer)
- 6 Optical Disk
- 7 Photosensor of Hand-of-Cut Polarization
- 8 Photosensor of the Centrifugal Direction Polarization
- 9 Subtractor Circuit
- 101 Laser Beam (Reflected Light)
- 102 103 Pit (record hole)
- 104 Pit Information on Aluminum Reflective Film 1
- 105 Pit Information on Aluminum Reflective Film 2

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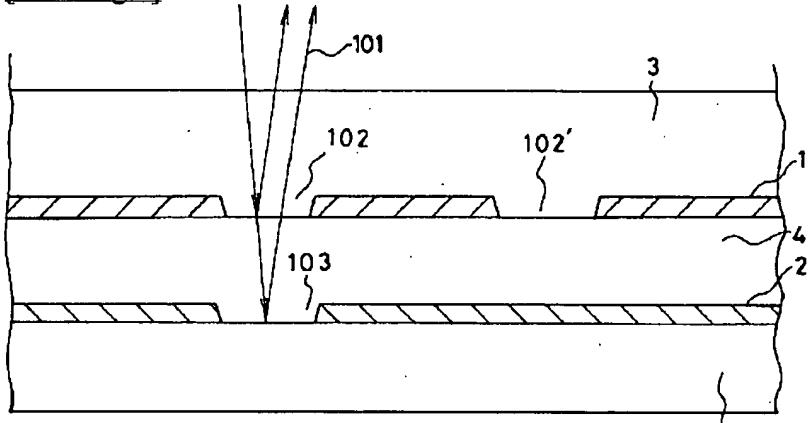
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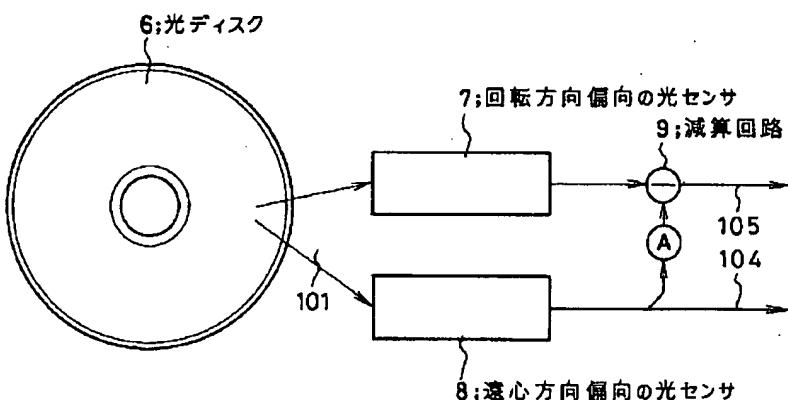
## DRAWINGS

## [Drawing 1]

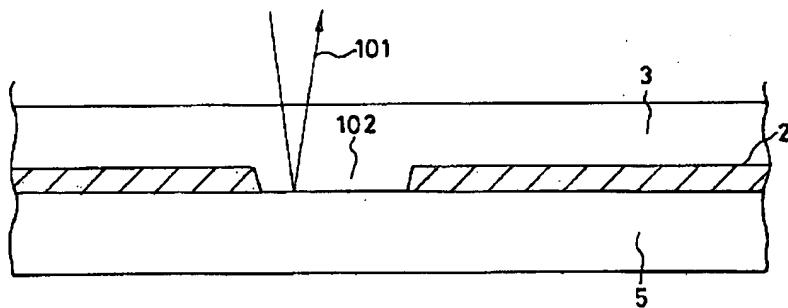


1;アルミ反射幕 1(反透過)  
 2;アルミ反射幕 2  
 3;透過層  
 4;偏光層(ディスクの回転方向に偏向)  
 5;ベース(保護層)  
 101;レーザ光(反射光)  
 102;ピット(記録孔)  
 103

## [Drawing 2]



## [Drawing 3]



2;アルミ反射幕 2  
3;透過層  
5;ベース(保護層)  
101;レーザ光(反射光)  
102;ピット(記録孔)

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[Translation done.]